1-1-1977

A Versatile Classifier Model for Multiobservational Analysis

Philip H. Swain

Reprinted from

Symposium on Machine Processing of Remotely Sensed Data

June 21 - 23, 1977

The Laboratory for Applications of
Remote Sensing

Purdue University
West Lafayette
Indiana

IEEE Catalog No.
77CH1218-7 MPRSD

A VERSATILE CLASSIFIER MODEL FOR MULTIOBSERVATIONAL ANALYSIS*

PHILIP H. SWAIN
Laboratory for Applications of Remote Sensing and School of Electrical Engineering
Purdue University
West Lafayette, Indiana 47907

The maximum likelihood decision rule, widely applied to the analysis of multispectral remote sensing data, can be generalized to handle a broad class of problems involving multiple observations. Such problems arise, for example, when it is desired to classify a location on the ground based on multiple passes over the site (temporal context); or to incorporate data from adjacent locations in the decision process (spatial context).

The generalization is accomplished by redefining the classification objective and applying statistical decision-theoretic methods. As a simple example, if observations $X_1=X(t_1)$ and $X_2=X(t_2)$ are available from two satellite passes, then under appropriate assumptions it is possible to show that an optimal decision procedure is to classify the location into the class $\omega_2=\omega(t_2)$ for which the posterior probability $p(\omega_2|X_1,X_2)$ is maximum. The trick, however, is to express this probability in terms of quantities which it is feasible to observe or estimate.

Several applications of this classifier will be discussed together with experimental results of its use.

*This research was supported in part by NASA Contract No. NAS9-14970.